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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for

SOIL CONSERVATION SERVICE RESEARCH**

JULY 1950

EROSION CONTROL PRACTICES DIVISION

Heavy Organic Residues Benefit Tobacco - C. S. Britt, Beltsville, Maryland. - "Heavy rainfall in July has caused severe erosion, leaching and compaction of the soil on most tobacco fields in the Southern Maryland tobacco belt. The damage was unusually severe since much of the tobacco was planted late due to plant-bed failures.

"On our research plots, tobacco following cover crops turned at the normal time is making very poor growth compared with tobacco following cover crops turned a month later than normal. As reported previously, this delayed turning adds about two tons (dry weight) of coarse top growth which appears to be resistant to decay.

"Planting and cultivating with mechanized equipment has often been difficult following the late turning of this coarse organic matter. This year all plots with heavy green manure crops were disked thoroughly with a weighted disk before plowing. This cutting and mixing eliminated most of the objectionable features of coarse organic matter. All planting and cultivation was done with machinery and resulted in a very good stand of tobacco."

Publications - A. W. Zingg, Manhattan, Kansas. - "A paper entitled 'An Air Elutriator for Determining the Dry Aggregate Structure and Erodibility of Soil by Wind', was prepared and presented for publication approval during the month. Another paper entitled, 'Investigations of the Effect of Various Crops and Tillage Methods on the Shearing Force of the Atmospheric Wind', was prepared in preliminary form. A work entitled, 'Report on Investigations of the Wind-Soil Movement Problem in the Sacramento-San Joaquin Delta Region of the Central Valley of California', was completed during the month."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

High Soil Losses at Madison - O. E. Hays, LaCrosse, Wisconsin.

"Clyde Bay reports high soil losses from spring grain. For the runoff period including July 1, there have been 5.4 inches of runoff and 13.5 tons per acre of soil loss from oat land. Winter wheat has given very good protection with only 2 inches of runoff and 2.1 tons per acre of soil loss. The winter wheat gave a much earlier cover to the land, therefore protecting it during the intense spring and early summer rains. Although no corn is under measurement in this experiment, large silt fans have been deposited at the end of off-contour rows above the measured plots and on adjoining farms. It is quite apparent that soil losses from corn in this area are quite high where not on the contour."

Permeability Rate on 'Slick Spots' and Normal Soil - Glenn M.

Horner, Pullman, Washington. - "At the request of the District Conservationist at Lewiston, Idaho, some permeability samples were taken from 'slick spot' areas of the Tammany section. The permeability rates of the slick spot soil were extremely low. Most of the samples failed to transmit any water during a 68-hour period. The results are summarized below.

Location	Depth of Sample (inches)	Permeability Rate	
		Field moisture (in./hr.)	Saturated (in./hr.)
<u>Slick spot</u>			
(a) winter wheat	1-4	.16	.08
	8-11	.00	.00
(b) fallow	2-5	.00	.00
	11-14	.00	.00
<u>Normal soil</u>			
(a) winter wheat	1-4	.67	.56
	8-11	3.51	3.33
(b) fallow	2-5	1.98	.59
	9-12	.68	1.56

"It is planned to take additional samples of this condition in order to obtain information at other depths and locations."

Progress Report on the Columbia Basin Soil Erosion Project - M. M. Oveson, Columbia, Missouri. - "Spring wheat on the Jim Hill pilot farm is looking very good having responded to the June rains with good head development and plant growth. The Elgin wheat which was seeded last fall did not emerge until late November and was backward throughout the spring. Very little difference can be noted between the wheat growing on the various tillage practices. Those plots which received 100 pounds of ammonium sulfate per acre at seeding time show a slight difference in plant vigor. Wheat growing on the stubble mulch plots appears to have just as vigorous plant growth and I believe will yield as well as the wheat grown on moldboard or black fallow. In the fertilizer trials it appears that the best yields will be obtained where 50 pounds of anhydrous ammonia was applied. These plants are more vigorous and have larger and better filled

heads. This wheat is just beginning to turn and will not be ready for harvest until the last of July or the fore part of August.

"One waterway was seeded on the Jim Hill farm to crested wheat grass early this spring. A very good stand was obtained which should be well established and capable of holding the land in place this coming winter.

"The spring wheat on the S. C. Crow pilot farm also looks very good. All spring wheat was grown on land that grew wheat in 1949 and was fertilized with 200 pounds of ammonium nitrate per acre prior to seeding. One demonstration area was set aside where anhydrous ammonia was applied and compared to ammonium nitrate. The results from this look very promising, since the anhydrous ammonia was placed at about an eight-inch level in the soil where the growing plants obtained benefit in early stages of growth. This was evident by the more vigorous plant growth and much darker green color. The wheat where the ammonium nitrate was applied did not give a comparable growth until after the rains which occurred the second week in June. Following these rains the wheat growing on land which had been fertilized with ammonium nitrate responded to the nitrate treatment very rapidly. It is questionable that the wheat treated with ammonia nitrate will obtain the vigor and head development that the wheat treated with anhydrous ammonia have shown. This wheat is still in the milk stage and will not be ready for harvest until near the middle of August.

"There was a very serious gully running across this farm from the South part to the West part. This gully could be crossed with farm machinery in only three locations. Following our seeding operations this gully was worked down with an offset disk, a grader and tumblebug scraper. A very fine waterway about fifty-feet in width was established. The upper part of this was worked early, and seeded to Intermediate wheat grass. The remaining part was so dry by the time the work had been completed that it was doubtful a good grass stand could be established. Winter wheat was therefore seeded which has emerged and is establishing a very fine turf. This wheat will be disked down next spring at which time Intermediate wheat grass will be seeded.

"We also have a serious weed problem on this farm, having several spots of morning glory and several spots of Canadian thistle, as well as an over supply of annual weeds. The annual weeds in the spring wheat was sprayed with 2-4-D. The Canadian thistle and morning glory were also sprayed with heavy applications of 2-4-D of two to three pounds of parent acid per acre at a time when the plants were making vigorous growth. The results from this spraying has been very gratifying, and it is hoped that we will reach a control measure by the use of tillage and 2-4-D spray."

Beef Cattle Preferred Kudzu on Limed Soil - B. H. Hendrickson, Watkinsville, Ga. - "Beef cattle showed a decided preference for the kudzu growing on a limed portion of a kudzu pasture in July, as compared to the equally luxuriant growth on the unlimed portion. The entire pasture receives an annual addition of phosphate and potash. A complete mineral and salt mixture is available to the cattle at all times. But they grazed down the limed kudzu, first. (This resembles Albrecht's observations in the Midwest on the preferential grazing on well-fertilized versus unfertilized meadow.)"

Hay Yields as Affected by Supplemental Irrigation - O. W. Beale,
Clemson, S. C.-"Drouth periods occurred during May and June which necessitated irrigations of the forage crop and corn plots to maintain predetermined moisture levels.

"One block of the forage crop plots is irrigated when 75% of the available soil moisture is exhausted at the 8 inch depth and one when 75% is exhausted at the 18 inch depth. One block of plots is not irrigated. Alfalfa, Ladino clover, Fescue and Ladino-Fescue mixture are the four crops planted with four replicates in each block.

"The yields for the different crops are given in the table 1 on the following page for the various treatments. Alfalfa was cut twice and produced the highest total yield. The highest yield of irrigated alfalfa is about 33% higher than the unirrigated. Since this is first year alfalfa the roots probably have not penetrated the lower zone to utilize the soil moisture at the 18 inch depth. There was little insect and disease damage to the alfalfa during this period of growth.

"The highest increase in yields of the irrigated over the unirrigated are for: Ladino clover 100%, Fescue-Ladino clover mixture 73% and Fescue 88%.

Soil and Water Loss in Relation to Cultural Methods with Corn - "Soil moisture in the mulch culture plots was raised to the field capacity level early in July. Light and heavy rains and high humidity caused this level or higher to be maintained throughout July.

"Rainfall which caused runoff was not exceptionally high, but was so intense that it produced considerable soil loss and runoff. Table 2 on the following page shows the percents runoff and soil losses for four storms occurring during this period. The total soil loss from the no cover crop, plowed, clean cultivated plots for the four storms exceeds the seven year average for these plots by 1969 pounds per acre. The total soil loss for these storms from the plots that had a vetch and rye cover crop and were plowed, clean cultivated was just under the seven year average by 43 pounds per acre. The soil loss from the mulch plots, disk harrowed was 131 pounds per acre less and that from the disk harrowed and ripped plots was 875 pounds per acre less than the seven year average. The percents runoff from all plots were high if compared with the seven year average, but actually heavy losses of water as runoff were from the plowed treatments only."

Table 1.--Yields of hay harvested from forage crop irrigation plots in May and June.

Treatment	Water applied inches	Alfalfa* Tons/Acre	Ladino clover Tons/A.	Fescue-Ladino clover. Tons/Acre	Fescue Tons/acre
Irrigated when 75% available water exhausted at 8"	8.92	1.80	1.54	0.89	1.23
Irrigated when 75% available water exhausted at 18"	8.92	1.80	1.44	1.02	1.09
Not irrigated	8.92	0.00	1.15	0.51	0.71

* Alfalfa cut twice, May 16 and June 13. All others cut once, June 13.

Table 2.--Soil loss and runoff during July 1950 from plots where corn followed vetch and rye.

Cultural method	Preceding cover crop	July 5, 1950 Rainfall 0.71"	July 14, 16, 1950 Rainfall 1.46"	July 23, 1950 Rainfall 0.90"	July 24, 1950 Rainfall 0.78"
		Runoff	Soil loss	Runoff	Soil loss
		%	lbs./A	%	lbs./A
Mulch, Disk harrow and Middle buster	Vetch & rye	1.26	101	1.36	107
Mulch, Disk harrow and ripping implement	Vetch & rye	1.69	160	1.78	134
Plowed, Disk harrow and Turn plow	Vetch & rye	22.68	1401	31.44	507
Plowed, Turn plow	None	40.42	3147	45.62	2231

Amount of Runoff in Relation to Tillage Methods - Harley A. Daniel, Guthrie, Oklahoma. - "The amount of runoff from the different methods of tillage on this station for the crop year is given in the following table.

Effect of Different Methods of Tillage, Direction of Cultivation, and Terraces on the Percentage of Runoff Water, Cherokee, Oklahoma 1/

METHOD OF TILLAGE	DIRECTION OF CULTIVATION AND TERRACES							
	With Slope		Contour		Terrace-Contour		Average	
	Big rain ² /	Annual	Big rain ² /	Annual	Big rain ² /	Annual	Big rain ² /	Annual
Stubble mulch	15.61	2.94	13.08	2.53	9.82	1.64	12.84	2.37
Plowed	32.61	5.06	30.57	4.57	25.62	3.77	29.68	4.47
Listed	37.42	7.19	9.20	1.55	7.64	1.53	18.09	3.42
Basin Listed	23.05	5.35	0.75	0.29	1.38	0.40	8.39	2.01
Average	27.23	5.13	13.40	2.24	11.12	1.83	17.25	3.07

1/ Crop year July 1, 1949 to June 30, 1950.

2/ High intensity rain of 2.32 inches occurring September 3.

"The rainfall for the crop year was 8.10 inches below the average. However, a large amount of the runoff water from the high intensity rains was saved. It was conserved by both mulches and rough surfaces. Where all cultivation was conducted up and down the slope runoff was the least from the stubble mulch plots and the most from the listed land. But, both listing and basin listing greatly reduced runoff water losses when they followed the contour. In fact, the average annual amount of runoff from the four types of plowing was reduced 59 percent when tillage followed the contour on terraced land."

Birdsfoot Trefoil Inoculation at Marcellus - G. R. Free, Marcellus, N. Y. - "In the monthly report for April, the effect of pre-inoculation of the soil on growth and stand of birdsfoot trefoil was discussed. On July 13, the following data on height were obtained:

	Poorly Drained Site	Well Drained Site
Pre-inoculated	21"	21"
Not Pre-Inoculated	12"	14"

"One of the duplicate plots, not pre-inoculated, on the well drained site shows signs of improvement while both replicates remain poor on the wet site. These plots were seeded on August 24, 1949."

Drill Trial With Small Grain - Torlief S. Aasheim, Havre, Montana. - "This spring a 14-inch deep furrow hoe drill was used in a triplicated test along with a double disc drill with 6-inch spacings to get some information on how satisfactory these drills are for seeding spring wheat, oats and barley. The 14-inch hoe drill is superior from the standpoint of operating in trashy ground and we were interested in knowing how yields following this type of drill compare with other drills. The barley and oats in this particular test have been combined; yields and test weights obtained are summarized in the following table:

<u>Barley</u>		<u>6-inch Double Disc Drill</u>	
<u>14-inch Hoe Drill</u>	<u>Bu. per acre</u>	<u>6-inch Double Disc Drill</u>	<u>Bu. per acre</u>
	<u>T. Wt. per bu.</u>		<u>T. Wt. per bu.</u>
32.6	43.6	33.5	44.0
<u>Oats</u>			
34.0	31.1	37.2	33.7

1950 Erosion Forecast for Southern California - Maurice Donnelly, Riverside, California. - "The last general erosive rain in California, long enough and hard enough to cause widespread erosion damage, came in January 1943. An erosive rain of moderate proportions, but spotty in character, fell in December 1945.

"Thus, during a rapidly changing period in California agriculture, the erosion hazard has been low. Erosion-control measures and structures installed during this period have yet to receive a major test. Moreover, there are many new people in California agriculture, both farmers and technicians, who have not yet experienced the destructive power of a subtropical storm in which as much rain may fall in a single day as the seasonal total for some of the drought years of the late 1940's.

"In addition to the need to be alert to potential erosion damage from future hard rains, there is the equally pressing need to conserve this rain-water to the maximum, getting as much of it underground as possible. Not a few irrigation districts in California are drawing on their last reserves of underground water. Replenishment of these reserves is as important as conservation of the soils irrigated from them.

"The purpose of the 1950 erosion forecast is to present an opinion as to the potential erosion hazard for the rainy seasons of the next few years. It should be remembered that we must rely solely on statistical data in making this forecast. Undoubtedly, there are researches under way which will ultimately provide current dynamic data on which to base an erosion forecast. Such data are not yet at hand and we have to rely on a study of rainfall records of previous years as a guide to what may be expected in the next year or two.

"In April 1943 I wrote 'We (in Southern California) apparently are at or near the beginning of a dry era.' The six years from 1944 to 1950 have been in point of fact the driest in the recorded history of the State. The 1943 forecast turned out to be more accurate than could be expected from the supporting data. These data, the rainfall record for Los Angeles from 1877 to 1943, show that there are periods when rainfall is much above, or much below, the long-term average. The exact duration of wet or dry periods cannot be fixed with any certainty from analysis of the comparatively short historic record. That wet and dry periods do exist is agreed to by all.

"In 1943 we neared the end of a period when rainfall was above average. Now, in 1950, we should be at or near the end of a period when rainfall has been below average. Hence, we should expect and plan for a series of years when the erosion hazard will be far higher than it has been in the last half-century."

Effect of Erosion on Crop Yields - O. R. Neal, New Brunswick, New Jersey. - "Erosion reduces soil productivity. Crop yields from eroded and uneroded soil areas have been measured on New Jersey farms for several years. When fertilization and other cultural practices are identical, yields are lower from eroded than from uneroded areas. The over-all averages for seven crops are shown in the following table.

Crop Yields from Eroded and Uneroded Areas on New Jersey Farms

Crop	Eroded	Uneroded
	0-6" topsoil	More than 6" topsoil
Potatoes	216 bu.	317 bu.
Corn	41	67
Wheat	18	38
Barley	26	54
Rye	11	37
Alfalfa	2.0 T.	3.3 T.
Asparagus	323 lbs.	728 lbs.

"These figures represent averages of several hundred measurements covering periods of from 1 to 9 years for the different crops. Each individual comparison includes the yield from an eroded and an uneroded area in the same field. Differences in variety, rate of fertilization, cultural practices, and weather are thus avoided in the comparison. The average of all the measurements for each crop shows a much higher yield from the relatively uneroded areas.

"It has recently been stated that fertility is the key to conservation. The above data suggest the possibility that the statement should be reversed. Perhaps we should say that conservation is the key to fertility. At any rate, the two elements are closely associated. Physical soil conditions which are most favorable for soil and water conservation are usually identical with physical conditions most favorable for efficient, high-yielding crop production. The only known method that is practical

and generally effective in maintaining favorable physical conditions in cultivated soils is the rotation of the cultivated crops with non-cultivated crops at regular intervals. These conservation rotations, supplemented by mechanical practices made necessary by characteristics of the land, will provide effective erosion control. The yield data indicate that such control is essential if high-yielding and most profitable crop production is to be obtained!

Soil Aeration - George R. Blake, Ass't. Research Specialist, New Brunswick, N. J.-"Aeration of a soil would be expected to be most deficient at times when the air pore space was reduced to a minimum. At such times the interchange of oxygen and carbon dioxide between the soil and the atmosphere would also be a minimum.

"A study has been carried on to investigate the intensity and duration of aeration minimum periods following wetting by rains or irrigation.

"Wide differences have been found between soil types. Before the wetting the soils studied had sufficient porosity and diffusion as to be considered well-aerated. After a wetting the period of time elapsing until what was considered to be adequate aeration had been resumed varied from a few hours in Sassafras loam to as much as four days in Croton. In the latter soil ridging and bedding are necessary to obtain crops of corn.

"Sassafras loam, one of New Jersey's better garden soils, continuously cropped to potatoes had less than 15% air space porosity for about 22 hours after wetting whereas the same soil in a 2 year rotation didn't drop below 15% air porosity upon wetting.

"These studies are now being prepared for publication."

Silt Yield from Mexican Springs Drainage Areas - D. S. Hubbell, State College, N. M.-"Although far from being completed, the data are demonstrating some very surprising facts. For example in the following table, long time records for comparable watersheds show approximately the same silt yield per acre regardless of the watershed size. Bad land areas yield at least three times as much silt as those areas having a normal plant cover. The second portion of the table illustrates the lack of difference between sampling methods. Where samples were collected from the running stream, and later compared with a surveyed amount of sediment deposited, no differences can be seen.

Silt Yield from Mexican Springs Drainage Areas
(Average Annual Yields 1936-42)

Long Time Records

Watershed	Sq. Mi.	Years of Record	A.F./Sq. Mi.	T/A
Mexican Springs	32	7	1.7	3.5
Catron	27	5	2.6	5.3
Figueredo	72	6	1.5	3.0
Deer Springs	5	9	1.1	2.3
Norcross	4	9	1.2	2.4
Muddy Creek*	6	9	3.5	7.2

Comparison of Sampling Methods

Sampling Method				
Deer Springs	Collected	32	3	1.3
	Surveyed			1.2
Norcross	Collected	4	3	1.4
	Surveyed			1.5
Muddy Creek*	Collected	6	3	7.9
	Surveyed			6.9
Figueredo	Collected	72	1	1.9
	Surveyed			2.0

* Bad land drainage

Summary of Progress with Conservation Farming on a Grant County Farm - H. O. Anderson, LaCrosse, Wisconsin. - "In the first twelve years of conservation farming, corn yields had risen from a 40-bushel average in 1935-36 to 75 bushels in 1946-49 or 35 bushels per acre on a Grant County farm as compared with 19 bushel average increase for the county as a whole. Improvement in oat yields amounted to 41 bushels per acre on this farm as compared with the county average of 27 bushels.

Table 1.--Crop yields, this farm and average for Grant County

	Corn Yields		Oat Yields		Hay Yields	
	Farm A.	Co. Ave.	Farm A	Co. Ave.	Farm A.	Co. Ave.
Pre-cons.	40	34	30	36	1.4	1.4
1938-41	63	47	36	34	2.5	1.8
1942-45	63	52	56	45	2.7	2.0
1946-49	75	53	71	53	1.8	1.7

"Higher yields per acre meant a greater total supply of grains as well as of roughages even though the acreage of grain was reduced, most of the gain being in corn production. Roughage production also was increased, especially as the result of the pasture improvement program.

"Net earnings on this farm were materially higher during twelve-year period of soil conservation than they were in the preceding period. As a matter of fact, the net income averaged from \$700 to \$1400 more on a constant price basis. Butterfat sales on this farm increased from an average of 2848 pounds in 1933-36 to a 5425 pound average for the last four-year period as compared with Grant County average productions of approximately 2300 pounds and 3300 for the same periods. Further expansion of the dairy enterprise could be made if the hay acreage was increased up to the point recommended in the soil conservation plan. An average of 16,200 pounds of hogs were produced in 1946-49 as compared with an average of 10,800 pounds during the pre-soil conservation period. These livestock production trends reflect the improvement in roughage production and the increases in corn yields.

Table 2.—Livestock organization

	Before Program	Average		
		1938-41	1942-45	1946-49
Cows, number	14.5	15	18	18.3
Young stock	8	10	8	10.7
Hogs, cwt.	108	131	172	162
Horses, number	6	6	6	3.5
Chickens, number	70	80	95	77
Butterfat sales, lbs.	2848	3875	4682	5425

Effect of Woody Residues - Roy C. Dawson, College Park, Md.-

"Woody residues were applied on November 30 at the rate of approximately 2 tons per acre on a dry weight basis. The residues were partly decomposed and leached from standing outdoors in a heap for a year or more. The plots receiving woody residues also grew a winter cover crop of vetch. These plots were compared with others growing a cover crop of rye and vetch in which rye and vetch in which rye predominated.

"Tobacco was transplanted on June 14 and 15. Samples were taken on June 13 and June 27. The plots containing the added woody residues were richer in nitrates than those without the residues. These results are contrary to those obtained a year ago with respect to the effect of woody residues. However, the different results may be explained by the different conditions under which the residues were applied. A year ago the woody residues had undergone only slight decomposition and leaching, were applied at a heavier rate (approximately 4 tons per acre), and were not accompanied by a good legume cover. A nitrate depression resulted.

Mean nitrate nitrogen content (ppm of N) of soil with and without added woody residues at different depths

Plot Management	Depth of Sampling			Management Means
	1st Foot	2nd Foot	3rd Foot	
Woody Residues + Vetch	11.04	5.55	3.01	6.53
Rye + (Vetch)	6.26	3.53	2.37	4.06
Depth Means	8.65	4.54	2.69	

	Least significant difference		
	5% level	1% level	0.1% level
Management	0.84	1.12	1.47
Depths	1.02	1.37	1.80
Management X Depths	1.45	1.93	2.54

"Nitrate content was greater in the top foot of soil, less in the second foot and least in the third foot. The effect of the plot management was greater in the top foot than in the second and third foot depths.

"On June 13 the nitrate level of the soil for all plots to a depth of 3 feet was 4.43 ppm. On June 27 it had increased to 6.15 ppm, a highly significant increase."

Root and Top Growth from an Annual and two Biennial Varieties of Sweetclover Seeded October 15, 1949 - J. R. Johnston, Temple, Texas.

"The June 5th sampling of roots and tops from October 1949 seeded Hubam, Madrid, and Evergreen sweetclovers gave some interesting data (see following table). The top growth from Hubam was much greater than from either of the biennial varieties. The root growth from biennial varieties during this period was considerably greater than root growth from the Hubam variety. It is interesting to note the differences in root growth between the fast growing Madrid and the slower growing Evergreen variety. By June 5th the Madrid had produced 1722 pounds of root material, the Evergreen 1026, and the Hubam 646.

Variety	Roots	Tops	Roots and Tops
	lbs/A	lbs/A	lbs/A
Hubam	646	4722	5368
Madrid	1722	2780	4502
Evergreen	1026	2645	3671

Effect of Cropping Practices on Infiltration in Houston Black Clay Soil -

"The effect of cropping practices on surface water intake into Houston black clay was determined on one replication in Rotation A, three infiltration runs were made on each plot. The averages of these determinations are reported in the table on the following page. These data are only preliminary and not conclusive. The high intake rate following Hubam winter cover and green manure indicates that some factor other than organic matter from the manure crop is affecting water intake, possibly the tillage method used in disposing of the green manure crop. It was surprising to find that water intake following one year of fescue, a perennial sod type grass, was lower than that following oats or Madrid sweetclover.

Treatment	Surface Water Intake Inches/hour
Continuous cotton	1.95
Continuous cotton, vetch winter cover and green manure	2.28
Continuous cotton, Hubam winter cover and green manure	4.18
Cotton, Hubam rotation	2.85
Cotton, Madrid rotation	4.70
Cotton, oats	4.80
Cotton, oats-Madrid rotation	5.08
Cotton following one year tall fescue	2.78
Cotton following one year fescue-Madrid sweetclover	3.85
Two years tall fescue	7.13
Two years tall fescue-Madrid sweetclover	6.10

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio. - "Rainfall for the month of July of 6.79 inches was the ninth highest total for the 50-year record at Coshocton. This value has been reached or exceeded three times in the 14-year station record--about the normal expectancy. Maximum rainfall intensities are given below:

Duration Minutes	Maximum In/hour	Recurrence interval (based on Columbus, Ohio, record)	
		Years	
2	9.00		?
3	8.80		?
5	6.60		25
10	5.10		15
15	4.08		10

"High rates of runoff occurred on the single cover small corn watersheds. The high rainfall intensities failed to produce much flood runoff in the larger watersheds. The peak flow from a 300-acre watershed was only 0.16 inch per hour. In 14 years of record on this watershed there were 12 annual peaks greater than this one. With high monthly rainfall and high rainfall intensities - no major flood developed, mainly because the rainfall was fairly well distributed throughout 12 days. Practically no runoff came from grass or wooded areas as the topsoil therein did not reach saturation. A different distribution of rainfall would have caused maximum floods.

"Conservation practices were effective in the reduction of runoff and erosion as presented in the following table:

Effect of conservation practices¹ on runoff and erosion on small watersheds²

Date	Check watershed ³			Reduction by conservation			
	Runoff		Soil loss	Runoff		Soil loss	Nitrate loss
	Total	Peak		Total	Peak		
	Inches	In./hr.	Tons per acre	Percent	Percent	Percent	Percent
July 5	0.36	1.16	3.0	60	61	90	Negative ⁴
18	.12	1.37	1.1	75	75	92	74
24	.55	1.73	3.1	35	51	79	0
26	.63	4.40	4.4	25	32	72	62

¹ Conservation practices are contouring and alfalfa in meadow.

² Land slope 12 percent.

³ Check watershed is in straight rows across the slope.

⁴ Nitrate loss on conservation watershed eight times greater than that on the check watershed.

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas. - "Precipitation for the month of July totaled 1.77 inches at Station 69 compared to a normal of 2.08 inches. The only month during this calendar year with more than normal rainfall has been February, and the deficiency of rainfall is showing up in very limited growth in pasture and meadow areas, but crop production has been quite good. During the period July 13 to July 15 there were heavy showers in the area, none of which fell upon the Government-owned land, but two of which occurred on the area above Gaging Station D. For July 13 the weighted rainfall above Station D was 1.63 inches, and on July 15, 1.98 inches. These two showers caused appreciable runoff for the area above Station D, maximum rates being 0.222 inch per hour July 13 and 0.536 inch per hour on July 15. There was no surface runoff from any of the areas on Government-owned land during the month. The past 3 years have been periods of very low runoff at this project. Table 1 shows the semi-annual runoff amounts for the period from 1940 through June of 1950 for area W-1 of 176 acres with conservation practices. The mean annual runoff for the period 1940 through 1949 was 8.561 inches. During the 3-year period July, 1947, through June, 1950, the total runoff was only 6.001 inches at Station W-1.

Table 1.—Runoff - Station W-1 - 176 acres

Year	Jan.-June	July-Dec.	Total
1940	1.032	8.156	9.188
1941	11.509	.506	12.015
1942	5.805	5.710	11.515
1943	1.421	.080	1.501
1944	19.482	1.760	21.242
1945	9.563	3.047	12.610
1946	7.449	1.125	8.574
1947	4.614	.009	4.623
1948	2.274	.007	2.281
1949	.962	1.102	2.064
1950	1.647		?
Mean annual runoff for 10-year period, 1940-49, 8.561. Total for 3-year period, July, 1947-June, 1950, 6.001.			

"Legumes seeded in the fall of 1948 on a Little Bluestem meadow made a big difference in hay yields in 1950. The increased yields in air-dry hay from the different legumes in the test over the check areas were as follows:

Black Medic	- 1449 pounds per acre
Hubam Clover	- 1228 pounds per acre
Singletary Peas	- 1215 pounds per acre
Reseeding Crimson Clover	- 594 pounds per acre
Bur Clover	- 517 pounds per acre
White Clover	- 362 pounds per acre

"All areas, including the check areas, received a uniform application of 200 pounds of 20 percent superphosphate in 1948 and 1949. The hay was harvested in July after the legumes had made seed and dried up. There was some green Hubam at the time the hay was cut."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska. "In July we received 5.65 inches of rain at the Meteorological station which is the highest July precipitation received at this station since the records were first started in 1938. Rains were well distributed over the month and were all below 1 inch except one rain lasting about 3-1/2 hours on July 8-9, which measured 2.24 inches.

"The following table shows the average peak rates of runoff from the small watersheds, in inches per hour, for various land use practices.

Table 1.--Average peak rates of runoff in inches per hour from approximately 4-acre watersheds
Storm of July 8-9, 1950

Corn straight row	1.34"/hr	Small grains straight row	1.04"/hr.
Corn contoured	.92"/hr	Small grains contoured	.78"/hr.
Corn subtilled	1.07"/hr	Small grains subtilled	.79"/hr.
Pasture - heavily grazed	.98"/hr	Meadow - Not cut	.04"/hr.

"The following comparison was made of rainfall and peak flow for the storm of July 8-9, on watershed W-3 containing 481 (untreated) and watershed W-5 containing 411 acres on which 55 percent of all terraces have been completed.

"Watershed W-3 received an average total rainfall of 2.14 inches; watershed W-5 received 2.26 inches of rain. The rainfall on both areas started at about 11:00 a. m. and lasted about 3-1/2 hours. The peak flow from watershed W-3 at 2:20 a. m. was 167 cubic feet per second or 0.344 inch per hour. The peak flow from watershed W-5 at 3:00 a. m. was 100 cubic feet per second or 0.241 inch per hour.

"On July 11, following the storm, cross sections and slopes of high water were taken below the Wm. Schumm place which contains about 45 acres of cultivated land in watershed W-5. This area is untreated. The peak flow was computed as about 80 cubic feet per second or 1.76 inches per hour.

"The above figures indicate that conservation practices reduce the peak rates of runoff and that there is also a lag in time on the peak flow from the area which is partially treated."

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan. "July 3, Messrs. O. H. Clark and W. H. Tody of the Michigan Department of Conservation, met with the Station Supervisor to discuss possible cooperation of the station with the department in the development of the Rifle River Watershed Conservation program. This program, as outlined, is an ambitious project aimed to improve wildlife conditions (notably fish), and decline food and sedimentation effects in the Rifle River Watershed through an intensive program of soil and water conservation in that watershed. The Station Supervisor strongly recommended that the Department of Conservation actively cooperate with Operations of the Soil Conservation Service and prepare a detailed working plan of the study. He indicated that research would probably be considerably interested in cooperating in the hydrologic phases of such a study.

"During the month extensive efforts were made to determine the cause of continual variations in the results of the continuous recorder of soil moisture, as compared with results obtained from the Bouyoucos bridge. A plaster of paris moisture block, which had been in continual operation on the recorder for slightly more

than a year, was excavated and examined. Outwardly, it showed little sign of deterioration. But when cut open, a wholly unanticipated condition was found: the electrodes were heavily coated with copper-sulphate, thereby indicating an electrolytic decomposition of the copper electrode and the calcium sulphate of the body of the unit. This decomposition was much more apparent than that noted in any blocks previously exhumed. It seems probable that the variations in results, previously noted, are due to increased capacitance caused by the formation of CuSO_4 around the electrode. This is verified by the fact that blocks which have been in continuous operation on the recorder require extremely high capacitance correction when read with the Bouyoucos bridge. This advanced electrolytic decomposition may be due, in large part, to the excessive amount of electrical current sent through the block, when operating with the recorder, in comparison with individual daily readings made with the bridge. It is conservatively estimated that, in a given period of time (say 12 months) the recorder sends 90 times as much current through the block as a Bouyoucos bridge will send, when readings are taken once daily over the same period. This being the case, it appears probable that variance resulting from increased capacitance due to these factors can be ameliorated in one of two ways. Capacitance effects of the recorder, itself, may be reduced through variations in the frequency, or the introduction of suitable fixed capacitors in the circuit. Or, the total amount of current sent through the blocks may be reduced by arranging to have the recorder operate only during and immediately following precipitation.

"In furtherance of this dual hypothesis, studies are being developed to evaluate the actual capacitance effect of the recorder over a period of time. At the same time, an electronic switch is being developed which will cause the recorder to automatically turn on at the onset of precipitation and operate until manually turned off upon cessation of the moisture changes resulting therefrom. It is felt that, through the application of one or both of these studies, the results of the recording moisture unit can be made more generally useful."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama. - "The July rainfall of 6.66 inches represents 121 percent of the 69-year average of 4.57 inches for Auburn. One rain of 2.77 inches on July 13 caused runoff from the erosion plots. It had rained 0.98 of an inch on July 12 and 0.23 of an inch on July 11. A summary of the water and soil losses from the plots that had a crop growing on them is shown in table 1.

Table 1.--Soil and water losses from erosion plots - Auburn, Ala.

Plot No.	Slope %	Vegetative cover	Water loss inches	Soil loss lb./acre
3	5	Cotton	1.52	936
4	5	Cotton	1.00	189
5	10	Cotton	1.54	4,230
6	10	Cotton	1.29	4,400
9	20	Corn	.82	1,430
10	20	Corn	0	0

"As explained in the June monthly report, plots 3 and 4 and plots 5 and 6 have had the same treatment to date. There is no apparent explanation for the differences in soil and water losses from these plots. A possible explanation for the differences in plots 9 and 10 is that 1,456 pounds of dry matter per acre (crimson clover) were turned under on plot 9 before the corn was planted and 2,873 pounds of dry matter (subterranean clover) were turned under on plot 10.

"In cooperation with SCS Operations personnel, 16 infiltration measurements were made with the simulated rainfall type-F infiltrometer and 9 infiltration measurements were made using the infiltration rings.

"These tests were made in Lee, Lowndes, and Mobile Counties on Lloyd, Orangeburg and Shubuta, and Faceville soils, respectively. Rain prevented tests being made in Baldwin County while in south Alabama.

"A summary of the results of the tests made with the infiltrometer is given in table 2 on the next page. A summary of the tests made with infiltration rings is reported in table 3 on the following page. It can be noted from the data in tables 2 and 3 that in all cases the infiltration rates were higher when the infiltration rings were used than when simulated rainfall was used. The two causes for the difference in the rates were probably the difference in the head of water (2 inches with the ring and only a thin film with simulated rainfall) and the impact of the raindrop. The raindrop impact probably tended to seal the surface of the soil.

"We feel that both determinations are useful. The data obtained using the simulated rainfall apparatus are applicable to sprinkler irrigation and that obtained using infiltration rings are applicable to furrow irrigation.

"Field-capacity and wilting-point determinations on these soils are reported in table 4 on the following pages.

"Permeability determination for the Lloyd soil on the Agricultural Engineering Farm, which was compiled by M. E. Stephens, State Soil Scientist, is shown on the mimeographed sheet which can be obtained from the project if so desired. Similar information will be obtained on all soils on which infiltration measurements are made.

"In addition to the information reported, soil samples were taken to obtain the moisture content of the soil after the infiltration tests were completed to determine the depth of penetration of water, mechanical analyses, apparent specific gravity, real specific gravity, and porosity (total, macro, and micro). Due to insufficient laboratory assistance the last four determinations have not been made to date.

"It should be pointed out that the studies to obtain information to be used in the design of irrigation systems are cooperative efforts of the SCS Operations, SCS Research, and the Alabama Agricultural Experiment Station. We are receiving excellent cooperation from SCS Operations. Mr. Sanders, Drainage Engineer, is selecting the sites on which determinations are being made and is assisting in running the tests. Mr. Stephens, State Soil Scientist, is making detailed descriptions of the soils, taking soil samples for the various laboratory determinations, and assisting in making the infiltration tests. Also, the local SCS Operations personnel in the area where tests are being made are giving assistance in making tests. To date we have had assistance from Messrs. J. C. Elder, Drainage Engineer, Dahms, Soil Scientist, W. E. McBryde, Conservation Aid, and May, Engineering Aid, in Dallas County and Messrs. C. T. Prout, District Conservationist, E. H. McBridge, Soil

Table 2.—Summary of infiltration tests made with the infiltrometer on four Alabama soils (July 1950)*

Test No.	Soil type	Soil surface condition	Depth of topsoil inch	Infiltration			Initial Soil moisture (%)			
				Total		Rate at end of	0-6	6-12	12-18	18-24
				1st hr.	2d hr.	2d hr.	2d hr.	2d hr.	2d hr.	
2,4	Lloyd	Loose	6	1.26	0.19	0.39	0.11	10.5	18.7	20.4
3,6,7	Lloyd	Crusted	6	•38	•0	•0	0	18.8	23.2	22.6
9,10	Orangeburg	Disked	3	1.26	•54	•74	•43	12.4	14.5	15.4
11,12,13	Orangeburg	Grass sod pasture	3	1.33	•60	•52	•35	12.4	14.5	15.4
14,15	Shubuta	Grass sod pasture	15	1.31	1.20	1.27	1.07	13.4	—	21.3
16,17	Faceville	Grass sod pasture	6	•70	0	•31	0	11.9	14.1	14.6
18,19	Faceville	Plowed, disked & cultipacked	6	•83	•02	•17	0	13.6	14.5	15.6
										16.6

*Data obtained jointly by S.C.S. Operations and Research

Table 3.—Summary of infiltration tests made with infiltration rings on four Alabama soils (July 1950)*

Test No.	Soil type	Soil surface condition	Depth of topsoil inch	Infiltration			Initial Soil moisture (%)			
				Total		Rate at end of	0-6	6-12	12-18	18-24
				1st hr.	2d hr.	2d hr.	2d hr.	2d hr.	2d hr.	
1,2	Lloyd	Loose	6	1.53	0.81	1.05	0.75	8.7	11.8	13.5
3	Orangeburg	Surface disked	3	1.16	•94	•95	•93	12.4	14.5	15.4
4	Orangeburg	Grass sod	3	1.16	•84	•84	•84	12.4	14.5	15.4
5,6	Shubuta	Grass sod	12	2.79	2.37	2.37	2.37	13.4	—	21.3
7,8	Faceville	Grass sod pasture	6	1.21	•96	•96	•96	11.9	14.1	14.6
9,10	Faceville	plow & disked	6	1.20	—	•81	—	13.6	14.5	15.6
										16.6

*Data obtained jointly by S.C.S. Operations and Research.

Table 4.--Field-Capacity and wilting-point determinations of four Alabama soils (July 1950)*.

Soil Type	Location county & farm	Depth inch	Field capacity 1/3 atmosphere % (dry basis)	Wilting point 15 atmospheres % (dry basis)
Lloyd	Lee - Ag. Engineering	0-3	18.7	12.9
	" " "	8-11	29.0	22.3
	" " "	18-21	29.7	21.3
	" " "	24-27	28.0	23.0
Orangeburg	Lowndes - Eiland	0-6	9.4	5.5
	" " "	6-12	14.2	10.5
	" " "	12-18	15.3	9.6
	" " "	18-24	16.6	9.9
Shubuta	" " "	0-6	10.9	4.9
	" " "	6-12	10.6	4.4
	" " "	12-18	15.1	9.5
	" " "	18-24	15.3	9.6
Faceville	Mobile - Williams	0-6	12.9	5.5
	" " "	6-12	13.9	7.9
	" " "	12-18	14.3	8.7
	" " "	18-24	15.1	9.5

*Determinations by V. C. Jamison and H. A. Weaver, U. S. D. A., B. P. I. S. A. E., Soils Division and J. E. Conniff, S. C. S. & Alabama Agricultural Experiment Station. (Dr. Jamison has generously offered us the use of his laboratory at the tillage laboratory to make field-capacity and wilting-point determinations until we are able to obtain the necessary equipment for our laboratory.)

Davidson, Drainage Engineer, J. A. Green, Work Unit Conservationist, and E. H. Walding, Conservation Aid, in Mobile County.

"Infiltration tests are being made only on soil types where specific requests have come from farmers who want help in designing irrigation systems. The farmers understand the need for this information and are very helpful in obtaining it. In one case, an irrigation system had been designed with the best information available which was insufficient. Now that infiltration and available water-holding capacities of the soil are available, it will be redesigned."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota. - "Mr. Blaisdell studied the problems involved in conducting tests on pipes which cantilever beyond their support and discharge directly into the stream bed. This type of outlet is popular for use in connection with pipe drop inlet spillways because of its low cost. Studies are needed to develop design rules and discover just how large a hole will be scoured. The first rough draft of a working plan was penciled out. The completion of the plan was delayed pending the replies to letters to several Operations engineers to discover the range of conditions which they wish to have us consider in making tests."

"Mr. Blaisdell began a re-analysis of some data obtained from pipe drop inlet spillway tests made in 1942 and 1943. This study is being undertaken in an attempt to glean information which we expect will prove useful to Operations engineers. Many questions have been raised as to the proper dimensions of the drop inlet to insure that the pipe will flow full when it is laid on a steep slope. The tests made on 6-inch vitrified tile pipe may provide a partial answer to this question. Some of the data were published in November 1942 but better methods of analysis have been developed since that time and a further study of the data are warranted."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma. - "July 1950 was the second rainiest July in local history. During the month 8.62 inches of rain were measured at the laboratory. There were no high intensities. The largest catch for a 24-hour period was 1.81 inches. However, the rains were frequent enough to interfere with the work at the laboratory."

"The forebay for channels FC 25 and FC 26 was sodded solid to Bermuda grass. The entrance to channel FC 25 was also sodded solid. Solid sodding was resorted to so that this channel could be ready for testing by the last of August. Channel FC 25 is the trickle channel."

"The approach to channel FC 8 was shaped and made ready for sodding. This channel is the large King Ranch Bluestem channel. It is hoped to have it ready for testing this fall."

"Most of the new channels at the laboratory are showing an excessive growth of annuals and weeds. The recent rains have made it nearly impossible to mow them or perform any other maintenance operations."

"The material for the 11 new wooden gates for block B and the four 9 foot gates for the FC 25 and FC 26 group has been cut out and treated with preservative. There remains only the assembling to complete the gates."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Fennimore was 12.2 inches for the month of July, which is higher than any month on record at nearby Lancaster where continuous records have been collected since 1891. Rain fell on only 9 days during the month. Of the total amount, about 7.4 inches came in 6 hours on July 15 and 16. This greatly exceeds the 100-year amount as given by Yarnell in Miscellaneous Publication 204. According to this same publication, the 4-hour amount would occur about once in 300 years and a 6-hour total even less frequent. This is the fourth time in 13 years that the 25-year rainfall has been exceeded on these watersheds. The total precipitation from January to July is 30.2 inches, while the normal for this period is 19.2 inches. Rates of runoff were not as high as might be expected with this amount of precipitation since the rainfall intensities for periods of less than 1 hour are considerably lower than for previous storms.

"New flood peaks were established on USGS areas of 100 or more square miles in Grant County. More than 40 bridges in the County were washed out and these included some less than a year old on main highways. The peak rate of runoff estimated by the USGS on 137 square miles was nearly three times the highest recorded in the last 15 years and amounted to about 260 cubic feet per second per square mile. There was no loss to the structures for gully control on small areas but sheet erosion was very serious on cultivated fields.

"Data on precipitation, runoff, and related factors are given in the tables on the following page. It should be noted that area W-II has had over 90 percent in excellent legume hay and pasture for the past 4 years and is representative of good conservation farming. Infiltration rates even on cultivated fields appear to be fairly high. This is probably due to the fact that there was little puddling of the surface soil under corn since it was about 3 feet high at the time of this storm."

Supplemental Irrigation - J. R. Carreker, Athens, Georgia.-"Rainfall was deficient the first half of the month and abundant the last half. A drought that began in June extended to July 11. The soil-moisture supply was critically low when showers began falling. Daily rainfall and irrigations are shown in table 1. Most of the 3.17 inches on July 23 fell in an hour and 15 minutes. Table 1 appears on the next page.

"Maximum intensities for this rain in inches per hour were: 2m, 6.60; 5m, 6.24, 10m, 5.10; 30m, 3.60; 60m, 2.66. Runoff from this rain was very high. Soil-moisture measurements indicated some relief was obtained by all crops from the rains beginning on the 11th. After the 23d, the soil was wet to a depth greater than the normal root zone. Evaporation losses from the pan totaled 6.71 inches and wind movement recorded was 981 miles during July.

Water was applied to the different crops as observations of soil moisture indicated a need. The schedule followed is given in table 1 on the next page.

"Sweet corn in Block IV was treated with DDT for ear worm control in a triplicated plot layout including: (1) apply with irrigation system, (2) apply with pressure sprayer, and (3) no treatment.

"Details of the materials applied for each application were:

	Sprayer	Sprinklers
50% wettable DDT - lb/ac	0.75	6.7
Mineral Oil - gal./ac.	2.5	22.3
Water - gal./ac.	22.5	800

Table 1.--Precipitation, runoff, and retention for storm of July 15-16, 1950, on Fennimore, Wis., areas

Drainage area	Precipitation--Inches				Runoff--Inches				Retention--Inches			
	W-I	W-II	W-III	W-IV	W-I	W-II	W-III	W-IV	W-I	W-II	W-III	W-IV
330 A	22.8	52.5	171	330	22.8	52.5	171	330	22.8	52.5	171	171
7:07 to 7:45 p.m.	1.88	1.85	1.79	1.88	0.29	0.13	0.18	0.31	1.59	1.72	1.61	1.57
9:10 to 10:15 p.m.	1.61	1.79	1.72	1.62	0.75	0.75	0.68	0.78	0.86	1.04	1.04	0.84
10:15 to 11:55 p.m.	1.67	1.68	1.71	1.71	0.63	0.48	0.56	0.71	1.04	1.20	1.15	1.00
11:55 p.m. to end	2.14	2.09	2.20	2.10	1.02	.90	.96	1.06	1.12	1.19	1.24	1.04
Totals	7.30	7.41	7.42	7.31	2.69	2.26	2.38	2.86	4.61	5.15	5.10	4.45

Table 2.--Crop cover and estimated infiltration rates

Crop cover - % of area	Estimated infiltration - In/hr.			
	W-I	W-II	W-III	W-IV
Corn	14.6	21.0	20.0	1.30
Sm. Grain	19.8	8.0	25.4	1.40
Hay	31.2	18.4	36.6	1.30
Pasture	28.9	81.6	12.3	0.85
Impervious Roads, etc.	2.5	3.3	2.0	0.80
Other	3.0	4.0	3.7	0.75

Table 3

Time	Maximum amounts & intensities of rainfall			
	In.	In./Hr.	In./Hr.	In./Hr.
5 min.	0.60	7.20		
10 min.	1.03	6.18		
15 min.	1.20	4.80		
30 min.	1.60	3.20		
60 min.	2.00	2.00		
2 hrs.	3.25	1.62		
3 hrs.	4.50	1.50		
6 hrs.	7.42	1.24		

Table 1.--Daily rainfall and irrigations in July at Athens, Ga.
Supplemental Irrigation Project

Irrigation

Date	Rainfall Inches	Vegetables		Corn Inches	Sweet Potatoes	Cotton
		I	II			
1		0.92		1.50		
2						
3				1.50*		1.50*
4						
5			1.50			
6	0.12		.50			
7						
8						
9						
10	.08		.50			1.00
11	.55				1.35	
12	.21					
13						
14	.20					
15	.25					
16	.15					
17						
18						
19						
20						
21	.05					
22						
23	3.17					
24	.30					
25	.51					
26	.33					
27	.53					
28	.12					
29						
30						
31						

Total 6.57

*At the Southern Piedmont Conservation Experiment Station, Watkinsville, Ga.

"The sprayer application ingredients conform to present recommendations of the Georgia Agricultural Extension Service. The Extension Horticulturist recommended the DDT and mineral oil content be increased to maintain the same relative diluting through the irrigation sprinklers as with the sprayer. Since our sprinklers applied 800 gallons of water per acre during the 3 minutes required to put the solution through the sprinklers the quantity of DDT and mineral oil seemed exorbitant. We arbitrarily reduced these items to the amounts shown.

"There was pronounced yellowing of the corn leaves in the plots where the DDT was applied through the sprinklers 1 week after the 3d treatment. Final results will not be available for another 2 to 3 weeks, however.

"A plot of young sweet corn 0.33 acre in size was fertilized July 12 with 25 pounds of RA-PID-GRO (trade name) fertilizer dissolved in water and applied through the irrigation system. This material was given the Agricultural Engineering Department by the manufacturer. Its analysis was 23 percent nitrogen, 21 percent phosphoric acid and 17 percent potash.

"The material was drawn into the pump with a secondary suction hose. Details of the application were:

Sprinkling began	11:50 a. m.
Fertilizer began entering pump	11:54 " "
All fertilizer enter pump	12:00 noon
Sprinkler ended	12:12 p. m.

Water applied 11:50 a. m. - 12:12 p. m. equal 0.29"

Total output of sprinklers equals 125.4 gpm

"There was no apparent damage to the corn from this application of fertilizer."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Light rains occurred throughout the area until July 22, with a few scattered showers until the 27th. Rainfall for the month varied from 5.37 inches to 15 inches with the average of 7.9 for the area. In 1949 the average was 8.8; in 1948, 7.4; in 1947, 11.5; and in 1946, 9.3 inches. Though little or no rain occurred during the period July 22 to 31, the average has been about the same as that of the past few years. In general the rainfall was fairly uniform throughout the area.

"In connection with the mulch plots, readings during the period July 1, to July 22, remained low. With little or no rain occurring after the 22d, we had a rapid increase in the readings for the natural cover and check plots, and on July 28 readings made showed that these two areas had reached the wilting point. In the shavings, pine straw, and grass mulched areas we had slight increases but readings showed that moisture at no time reached a critical point.

"Readings of our moisture blocks in mature lime and avocado groves showed that the wilting point had been reached about the 28th for the limes. While readings increased in the avocado groves there still remained sufficient moisture at the end of the period.

"In general leaching of nitrates has not been excessive during this period as no heavy intense rains occurred. On one grove in the northeastern portion of the area where rainfall apparently was less than in the rest of the section, we found that we were not getting the release expected from the type of nitrogen applied. A portion of the sample collected as held at optimum moisture for a week, and we had an increase from 10 to 50 p. p. m. At the end of the second week analysis of the sample showed that there was somewhat over 100 p. p. m. of nitrate nitrogen in the sample."

Sedimentation Studies - D. A. Parsons, Minneapolis, Minnesota.-"Work was continued on the design and calibration of the Coshocton wheel sampler for run-off. Tests 1 to 30 inclusive of Series 44 were made in the calibration of a 3-foot diameter wheel. The jet from a 1-1/2 foot type H flume was sampled.

"The capacity of this sampler is 5-1/2 cubic feet per second. The sampling slot width was constructed with the intent of catching two-thirds of 1 percent of the flume discharge. The constant flows in the several tests ranged from 0.01 cubic foot per second to 4 cubic feet per second. The measured sampler flow varied from the intended catch in all tests by less than 10 percent.

"Construction and installation details for the 1-foot, 2-foot, and 3-foot samplers were studied, and drawings started on the plans for the 2-foot diameter wheel."

Sedimentation Studies - R. Woodburn, State College, Miss.-"A trip was made to Vicksburg, Miss., for a conference with the Hydraulic Division of the Waterways Experiment Station relative to the use of the large sand bed model for verification studies on some of our sand transport calculations. This model has a sand bed about 75 feet wide and about 800 feet long and has a water capacity of approximately 100 cubic feet per second. I am very anxious to attempt to calculate the transport capacity of this model under full flow and to verify it by measured weights of sand transported. The Mississippi River Commission was using the model in preparation for studies of the Greenville bends, and it was not available for my use. I am hoping that in the near future this test can be made."

Sedimentation Studies, L. M. Glymph, Jr., Lincoln, Nebraska.-"Observations were continued during the month to record conditions of the corn on the flood-plain plots established following the flood of May 8 and 9 in southeastern Nebraska. A series of surface soil samples was taken from each area for nitrate determinations. The corn was planted on the Hooper Creek field on June 5 and on the Salt Creek field on June 7. There has been plenty of rain on both areas since the corn was planted and in each case the crop looks good. Some interesting differences in the stand and height of plants are very noticeable, however, particularly on the Hooper Creek field where the stand is much thinner and the corn shorter on the scour area than on either the area of recent deposition or the area of neither scour nor deposition. By the middle of July it averaged about 15 inches tall on the scour area, about 30 inches on the no-change area, and about 36 inches on the area of deposition. Toward the end of July it was about 4 feet high on the scour area, about 6 feet on the no-change area, and about 7.5 feet on the silted area. Both stand and height of corn are more uniform on the Salt Creek field. By the middle of July the corn was about 30 inches tall on both the scour and deposition areas, and about 6 feet tall by the end of the month. The Salt Creek field was flooded on July 31 to a depth of about 2 feet on the deposition area and about 3 feet on the scour area. A few stalks were bent over by the currents on the scour area but there was no apparent effect on the corn on the silted area."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"July was unseasonably dry and the water table failed to rise in the Everglades as is customary for this month during a year with normal rainfall. In fact, the water table has been so low that it has not been feasible to run pump efficiency tests at the Everglades Experiment Station, nor to re-run the subsidence course along the levee of the Hillsboro Plantation where travel is accomplished using a boat in the borrow pit paralleling the levee.

"Trips were made to Vero Beach in company with a member of the Engineering Department of the Flood Control District, where a conference was held with members of Operations of the Soil Conservation Service and the Indian River County Engineer to discuss and consider a proposed evaluation program of water resources and uses in the Indian River Farms Drainage District. A subsequent report was prepared recommending a cooperative program for this study, and a fund of \$1,500.00 was

voted by the Flood Control District for meeting travel and miscellaneous expenses.

"Members of the U. S. Army Corps of Engineers staff spent, in all, approximately 1 week on the project where they made a study of our experimental records concerning seepage, evaporation, and transpiration and related data, and many of our records were loaned for further study. As a result of our meetings the possibility of establishing an inter-agency program for study of problems arising from the Federal Flood Control program for central and southern Florida was proposed by the U. S. E. D. representative. Such a program is to be inaugurated at the Washington level of all agencies concerned."

IRRIGATION AND WATER CONSERVATION DIVISION

Consumptive Use in Pajaro Valley, Calif. - H. F. Blaney, Los Angeles, Calif. - "The Pajaro Valley investigation, in cooperation with the Division of Water Resources, State of California, and the Soil Conservation Service Work Group at Watsonville, was completed and a final report on 'Irrigation Practices and Consumptive Use of Water in the Pajaro Valley' was prepared by H. F. Blaney and P. A. Ewing. This area includes the Pajaro and the Elkhorn soil conservation districts. Normal unit consumptive use of water for irrigated crops in the valley, based on irrigation, temperature, precipitation, and other data are shown in the following tabulation:

Crop	Computed consumptive use of water					
	Winter		Irrigation		Annual	
	November 1 to March 31	April 1 to Oct. 31	season			
	<u>Inches</u>	<u>Feet</u>	<u>Inches</u>	<u>Feet</u>	<u>Inches</u>	<u>Feet</u>
<u>Irrigated</u>						
Alfalfa	9.0	.75	28.7	2.40	37.7	3.15
Artichokes	8.0	.67	12.5	1.04	20.5	1.71
Beans	8.0	.67	10.0	.83	18.0	1.50
Beans ¹	8.0	.67	11.2	.93	19.2	1.60
Berries	8.0	.67	10.0	.83	18.0	1.50
Lettuce - truck ²	8.0	.67	13.4	1.12	21.4	1.79
Lettuce - 2 crops ²	8.0	.67	9.9	.83	17.9	1.50
Lettuce - 3 crops ³	5.5	.46	15.0	1.25	20.5	1.71
Miscellaneous	8.0	.67	10.0	.83	18.0	1.50
Orchard (old) ²	10.0	.83	14.0	1.17	24.0	2.00
Orchard (old) ⁴	5.0	.42	14.0	1.17	19.0	1.59
Orchard (young) ²	10.0	.83	11.0	.92	21.0	1.75
Orchard (young) ¹	8.0	.67	16.0	1.33	24.0	2.00
Pasture	9.0	.75	24.0	2.00	33.0	2.75
Strawberries	5.0	.42	14.1	1.18	19.1	1.60
Sugar beets	10.0	.83	11.5	.96	21.5	1.79
Sugar beets ¹	8.0	.67	19.2	1.60	27.2	2.27
Tomatoes	10.0	.83	11.5	.96	21.5	1.79
Truck	10.0	.83	10.0	.83	20.0	1.66

¹With spring lettuce crop.

²With winter cover crop.

³Without cover crop.

⁴Clean cultivated.

Water Requirements, Northeastern States - H. F. Blaney, Los Angeles, Calif. - "Analysis of temperature and precipitation records in several areas in the Northeastern States indicates that even in years of normal precipitation some crops should be receiving supplemental irrigation by sprinkling to obtain maximum crop production. However, until more research data are available on infiltration rates, water-holding capacity of soils, depth of root zone for different crops and effective precipitation, definite recommendations as to irrigation practices are inadvisable. Monthly and daily consumptive use of water may be estimated from climatological records. Tentative estimates of monthly consumptive use at Ithaca, N. Y., are as follows:

Month	Consumptive use of water, in inches			
	Irrigated pasture	Potatoes	Vegetables	Deciduous orchard & grapes
May	4.3			3.2
June	5.1	4.0	3.7	3.7
July	5.5	4.4	4.0	4.0
August	4.9	3.9	3.6	3.6
September	3.9			2.8

Sprinkler Studies - G. M. Litz, Los Angeles, Calif. - "Field work on the cooperative sprinkler irrigation study in Antelope Valley was begun this month. The investigation is designed to test sprinkler performance in a high prevailing wind area. The two test plots are located on the University of California Experimental Farm. Test 1 was made on July 11 and test 2 on July 25 and 26, 1950. A portion of the data obtained from the two sprinkler tests is tabulated below:

Item	Plot I		Plot II	
	Test 1	Test 2	Test 1	Test 2
Spacing, feet	50 x 50	50 x 50	20 x 50	20 x 50
Mean temperature °F.	90	91	90	93
Mean relative humidity, percent	40	31	40	32
Wind movement, m. p. h.	7.2	2.9	5.1	3.3
Nozzle pressure in lbs. per squ. inch	40	43	37	37.5
<u>Depth of water applied, inches</u>				
Average metered flow	2.04	3.39	2.10	4.50
Measured in rain gages:				
Average for plot	2.03	3.61	2.11	4.59
Average at sampling point	1.41	3.15	1.41	3.63
Gain in soil moisture	1.16	(1)	1.48	(1)

1 Soil sampling results for test 2 will be available later.

"Now that the performance of the sprinkler systems has been tested under low wind conditions, it is proposed to make future tests during periods with higher wind velocities to try and determine the influence of wind on the distortion of the distribution pattern obtained from numerous small diameter rain gages."

Rainfall and Irrigation Penetration - D. C. Muckel, Pomona, Calif. - "A progress report covering cooperative investigations on rainfall and irrigation penetration in the Bunker Hill, Devil Canyon, Cajon, Lytle, Rialto, Colton, and Reche Canyon basins was completed in rough draft during the month."

Water Spreading for Recharge of Underground Basins - A. T. Mitchelson, D. C. Muckel, E. S. Bliss, C. E. Johnson - San Joaquin Valley - "During the month a new percolation-tube rack was built with space for 36 percolation tubes. Thirty-six tubes were packed with varying mixtures of soil and gin trash and will shortly be started. Objective of this new group of tubes is to study the following:

1. Length of incubation period needed for maximum benefit to percolation rate.
2. Type of flooding most beneficial for incubation (continuous or intermittent).
3. Effects of spreading the same amount of trash through a greater or lesser depth of soil.
4. Effect of burying the trash.

"Results from a group of 10 tubes having 15 tons per acre of gin trash spread on the surface, indicate that continuous flooding has been more effective than intermittent flooding as an incubation measure. In this test, four-time periods were tried: 2 weeks, 4 weeks, 8 weeks, and 16 weeks. Two tubes were used for each period, one being continuously, and one intermittently, flooded. After incubation the tubes were dried to approximately 1 percent moisture and re-started. At every time interval, the continuously flooded tube reached a higher percolation rate than the intermittently flooded tubes and to date, has maintained a higher rate over a period of 2 weeks or more. Only a limited number of tubes were available for control (no gin trash treatment) when this experiment was begun, but from what we had, it appears that under conditions of this experiment, 8 weeks of continuous flooding was needed to make a positive improvement in percolation rate of the gin trash tubes over the control tubes. None of the tubes incubated by intermittent flooding had as high a percolation rate on the second run as any control tubes. However, the longer the incubation period, the higher the percolation rate within this group.

"Percolation tests were continued using 'Renex' detergent in tap water at the rate of 100 ppm. Results of this test are summarized in the following table:

Table 1.--Effect of 100 ppm 'Renex' detergent on percolation rates and micro-organism populations of soil in percolation tubes

Soil	Treatment	Total micro-organisms			Fungi			Percolation rate		
		millions per gram			thousands per gram			cc. per hour		
		Time (days)			Time (days)			Time (days)		
		8	12	23	8	12	23	1	8	12
Hesperia	Tap water	71	63	61	77	76	88	52	40	29
sandy loam	Tap water									25
	& Renex	83	75	76	61	69	14	49	8	3
Exeter	Tap water	71	46	42	60	81	60	38	34	27
sandy loam	Tap water									17
	& Renex	83	50	86	52	64	6	36	8	5
										3

"In both the Hesperia and the Exeter soils the addition of 'Renex' detergent had the immediate and lasting effect of lowering the percolation rate and increasing the total number of micro-organisms in the Renex-treated tubes as compared with the tap-water treated controls. The fungi appear to have been inhibited by the Renex as evidenced by the lower numbers of these organisms found in the 'Renex' treated tubes. At the time of the last sampling date, 23 days after the 'Renex' treatment was begun, a distinct odor of hydrogen sulfide gas was evident. The presence of this gas suggests anaerobic conditions. Since most fungi are strictly aerobic, the anaerobic condition established after 23 days treatment with 'Renex' may in itself have had a distinct depressing effect and probably was the reason for the nearly complete suppression of the fungi. Anaerobic organisms were not enumerated in this test. It may be expected, however, that these organisms would become more abundant as the percolation rate dropped off and conditions became

more favorable for their development. This phase should also be investigated in future tests.

"Organic matter decomposition studies were continued through the month of July and 30-day decomposition rates calculated. As expected, the rates declined rapidly after the initial 15-day period.

"The field test ponds at Minter Field and Wasco were inspected during the month. Percolation rates for the two buffer ponds were worked up for the month of June and a part of July. These ponds are now shut down for drying. It appears from the operation of these ponds and the soil sampling immediately adjacent, that lateral percolation is not an important factor in water spreading, at least with the soil and subsoil conditions at Wasco. All evidence indicates that the problem of obtaining and maintaining high infiltration rates is confined to the surface soil. These same conclusions were reached during the Azusa tests. Fifteen-day average rates of all field ponds were calculated for the past 6 months' record. Using 15-day averages for analysis simplifies the comparison of different pond treatments as minor fluctuations are ironed out."

Friction Losses in Pipes and Fittings - C. Rohwer, Ft. Collins, Colorado.- "Copies of my report on Friction Losses in Selected Valves and Fittings for Irrigation Pumping Plants, which was published by Colorado Agricultural Experiment Station as Technical Bulletin 41, became available in July. This report contains the results of a study of friction losses conducted in cooperation with the Experiment Station. The study shows that the losses in most valves and fittings are small except when carrying more water than normal for the particular size of valve or fitting. Friction losses in gate valves increase rapidly as the percentages of opening decreases. However, basket strainers and bell entrances reduce the loss in suction pipes, and a combination bell entrance and strainer also reduces the loss. This is important because reducing the suction lift on a pump is an important factor in determining the capacity of a pump as well as in decreasing the total head."

Irrigation Water Management and Drainage Practices in the Production of Hay and Forage in the High Mountain Valleys of Colorado - H. K. Rouse, Gunnison, Colorado.- "While the weights and analyses of the samples harvested from the 256 sub plots have not been tabulated, certain of the results of fertilizer application seem obvious. Even the casual observer can note the checkerboard appearance of the experimental area. In general, the growth on the check plots was light and observers estimate the volume on these plots at from 10 percent to 20 percent of that on the plots receiving the maximum application of fertilizer. For the most part, the response to an application of 200 lbs. of P_2O_5 to the acre was negligible with the exception of two plots where there was a large percentage of clover. In these plots, the growth of clover was considerably greater than that on any check plot. As between plots receiving 40, 80, and 160 lbs. of nitrogen per acre, the relationship appeared to indicate a straight line ratio of volume to application of nitrogen, with the plots receiving only 40 lbs. of nitrogen showing a considerable increase in volume over the check plots.

"Volumes of vegetation on plots receiving 160 lbs. of nitrogen, 160 lbs. of nitrogen plus 100 lbs. of P_2O_5 , 160 lbs. of nitrogen plus 200 lbs. of P_2O_5 appeared substantially equal indicating that there is little response to the phosphorous up to this time. This effect is in agreement with the opinion expressed prior to the start of the experiment that the effect of phosphorous would not be generally apparent until the second year."

"No effect due to the seeding of legumes in the sod was expected before next year, and none was noticed."

"In certain instances where randomization brought a check plot beside a plot with a heavy application of nitrogen, the results were startling with the heavier vegetation forming a veritable wall and having a decidedly better color."

"In addition to the effects of fertilizers noted on the factorial experiment on the Blackstock ranch, similar effects were noted on the seven demonstration areas located at elevations from 7,600 to 10,000 feet above sea level. Several of these plots showed a greater response to the treatments at the higher, better drained and less heavily irrigated ends of the plot than at the lower ends where the soil was covered with water much of the time."

Weber Basin Utah Investigations - W. D. Criddle, Boise, Idaho. -- "At the request of Mr. George D. Clyde, Chief, Division of Irrigation and Mr. Murphy, Department of Agriculture Representative, Mr. Wayne D. Criddle attended the U. S. Department of Agriculture Council Meeting in Ogden, Utah, the morning of July 26. The purpose of attending this meeting was to familiarize himself with the Weber Basin Project proposed by the Bureau of Reclamation. Mr. Warnick of the Bureau presented the various features of the proposed project. This 70 million dollar project has been approved by the President but with the stipulation that the Department of Agriculture pass on various agricultural phases of the project. It is proposed that the Division of Irrigation, Soil Conservation Service, will handle certain phases of this investigation, in cooperation with the Utah Agricultural Experiment Station, Operations of SCS and other Government and State agencies. It is believed that this is the first Bureau of Reclamation Project that has had to be reviewed and approved by the Department of Agriculture before construction was allowed."

"The agricultural economics features of the project are well under way and it is proposed that the water requirement, drainage, engineering, and other features will be reviewed by the various departments within the next 9 months."

Irrigation Studies - C. E. Houston, Reno, Nevada. -- "July records of the evapo-transpiration station at the Experiment Station Farm show that the newly planted pasture tanks received about 3 inches of water while the older alfalfa tanks received about 6 inches. The pasture mix of Lincoln Bromegrass, Alta Fescue, and 48 Nevada alfalfa will be cut at the end of the growing season to simulate grazing. The first cutting of alfalfa gave an oven dry yield of 1.34 tons per acre."

"The 0.25-acre experimental alfalfa forage plot consumed approximately 9.75 inches of water during July. This brings to 21.6 inches the water consumed during the 1950 irrigation season. Two cuttings have produced about 4 tons per acre oven dry weight or slightly more than 5 inches consumed per ton, oven dry, so far this season."

"The following July climatological records for the station show:"

Average temperature	70 degrees
Average Relative Humidity	62 percent
Precipitation	0.05 inch
Wind	511 miles
Evaporation	9.12 inches

Irrigation Studies - F. M. Tileston, Ontario, Oregon.-"Dr. Albert Marsh and Mr. Ahmed Samie came to the station to supervise the taking of undisturbed soil cores to be taken to Oregon State College at Corvallis where greenhouse studies are to be made to try to determine the reason why plant roots do not penetrate the nodular layer which is generally about 18 to 24 inches under the surface. Our studies to date indicate that water passes through this layer but there is some restriction causing roots to stop at this layer. The Utah Core Boring machine was made available for our use by the Bureau of Reclamation, Reg. 1, and three undisturbed cores were taken from each of the eight plots to a depth of about 40 inches. Very little difficulty was encountered in removing the soil cores as the plots were maintained at or about field capacity. Some difficulty was encountered in some of the locations because the soil had been allowed to dry out considerably below field capacity. As a result of last year's experience and this year's experience with this machine, we have concluded that for our soils in order to take samples that will not be broken or collapsed that the soil cores should be at or near field capacity for the type of soils with which we are working. Numerous undisturbed 8-inch sections were cut from these cores and placed in 8-inch half gallon ice cream cartons and have been transported to the Oregon State College. These undisturbed 8-inch sections fit very nicely into these 8-inch cartons and it is hoped that they can be transported without breaking to the College."

"Volume weight samples can be taken with this core boring device but we find that it is much easier and more convenient to take volume weight samples by means of the Improved Pomona Sampler which was especially built for us in the Logan shops. By means of the Improved Sampler we can take undisturbed cores without disturbing the crop and take more samples and more readily than can be taken with the Utah Coring Machine."

Silt Studies - D. W. Bloodgood, Austin, Texas.-"All current silt determinations have been completed and tabulated for May. Typed copies of these data have been mailed to our cooperators, namely, Lower Colorado River Authority, Brazos River Conservation and Reclamation District, Army Engineers Corps, Galveston, and the Water Departments of the Cities of Houston and Corpus Christi."

"Most of the mats for multilithing the eleventh annual progress silt report have been prepared. This report will be multilithed and ready for distribution during August."

"Commencing August 1 our new cooperative silt laboratory address will be 813 Red River Street. Heretofore, the laboratory has been located in the basement of the Land Office Building. The building now occupied by the laboratory is new and contains approximately 2,000 square feet of floor space. The State Board of Control is paying \$150 monthly rental for this space, which is to be used for our cooperative silt, irrigation, and evaporation studies with the State Board of Water Engineers."

Irrigation Studies - N. P. Swanson, Amarillo, Texas.-"Rainfall on 14 days during July, totaling 6.99 inches, with only one 5-day period of dry weather, eliminated any necessity for irrigation and has made it difficult to do field work following the 5.05 inches of rain received during June. The sorghum plots are now very weedy. It is evident that the only barrier to gravitational moisture movement is in the upper 5 to 6 feet of soil."

"It appears certain now that not more than one additional irrigation will be of benefit to the grain sorghums in the irrigation studies this season and only two differential treatments be possible. Sudan grass plots will be ready to mow before

Meteorological and Evaporation Data at Wm. Harris Reservoir
 (Dow Chemical Company, Cooperator)
 from December 1948 to November 1949, inclusive

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Month	Mean Temperature deg. F	Mean relative humid- ity	Wind movement	Precip- itation	Evaporation losses				Coefficient for conversion of evaporation from			Remarks	
					W.B. pan	B.P.I. pan	D.I. pan	W.B. pan	W.B. pan	D.I. pan			
								to evap.	to evap.	from D.I.			
1948					Miles	Inches	In.	In.	In.	Ratio	Ratio		
Maxi- mum	71	.43	2,137	0.50	2.768	2.384	2.477	89	86	104	104	Station started	
1949	62	.42	2,683	3.40	1.868	1.978	2.041	109	106	103	103	November	
Jan.	66	.50	2,151	6.40	1.572	1.220	1.552	99	78	127	127	13, 1948	
Feb.	52	.52	2,663	3.86	4.106	3.224	2.934	71	79	91	91		
Mar.	72	.57	2,241	7.69	3.630	3.062	2.732	75	84	89	89		
Apr.	77	.68	2,212	0.72	6.788	5.572	4.680	69	82	84	84		
May	87	.72	1,664	2.95	6.994	5.962	5.302	76	85	89	89		
June	92	.71	1,179	4.93	6.670	5.618	4.884	73	84	87	87		
July	93	.71	1,174	4.58	7.389	6.436	5.722	77	87	89	89		
Aug.	94	.68	1,422	2.06	5.286	4.724	4.144	78	89	88	88		
Sept.	89	.64	2,054	23.17	3.674	3.370	2.748	75	92	82	82		
Oct.	78	.49	1,458	0.35	3.854	3.338	3.012	78	87	90	90		
Nov.	75		23,033	60.61	54.599	46.888	42.228	(77)*	(86)*	(90)*			
Totals													
Mean	80	.59											

*Not an average - computed figure for the year.

they will require irrigation and no differential irrigation treatments will be possible."

Irrigation Studies - P. E. Ross, Weslaco, Texas.- "Measurements of soil temperatures have been recorded during the growing season in the moisture level and cotton spacing experiments conducted by Mr. Bloodworth. The surface inch of soil has generally been reading a temperature of 130° F. by 12:00 noon and remaining above that until 4:30 to 5:00 p. m. The maximum temperature recorded on the soil thermograph for July was 145° F. between 1:00 and 2:00 p. m. on July 11. It was interesting to note that the irrigation of July 16 lowered the soil temperature in the topsoil from 140° F. at 3:45 p. m. to 91° at 4:45 p. m. It was also interesting to note that the temperature did not rise above 130° for six consecutive days after irrigation."

Irrigation Studies - S. J. Mech, Prosser, Washington.- "A total of 42 plot irrigations were made this month. The 'medium' plots were irrigated beginning July 19, and the dry ones beginning July 27. This is the first irrigation for both groups since planting on May 6. On July 31, the 'wet' plots began receiving their fourth irrigation after planting.

"The 2.73-inch precipitation during June tended to delay the full influence of our different soil-moisture treatments. However, the pre-determined differences in soil moisture were finally reached and some unexpected differences in corn responses showed up. Up to about the middle of July, there were no differences between plots. Suddenly the 'wet' plots began to out-grow the others until on July 22 the plants averaged 6.0', 4.2', and 4.2' high on the 'wet,' 'medium,' and 'dry' plots, respectively. The 'wet' ones were turgid and dark green, the others a pale green and prone to wilt in the midday heat. On July 27, just 5 days after the first heights were taken, the same plots measured 7.0', 5.6', and 4.4', respectively. It seems that since their irrigation on July 19 - 22, the 'medium' plots turned dark green and are beginning to catch up to the 'wet' ones.

"We are taking daily height measurements on a number of plants in each treatment to see what the rate of growth will be for the next couple of weeks.

"The rate of tasselling was greatest on the 'wet' plots, and less on the 'medium.' The 'dry' plots were farthest behind on the tasselling. With the addition of irrigation water, even the 'dry' plots appear to have taken on new life. By July 31 the 'wet' plots were in full tassel, but the 'dry' are only about 25 percent out.

"Previous experimentation with alfalfa, potatoes, and beets showed that the apparent temporary setbacks due to moisture stress were wiped out by subsequent irrigations."

